REVIEW OF PHASE III REMEDIAL ACTION PLAN
FORMER AEROVOX FACILITY
NEW BEDFORD, MASSACHUSETTS
RTN 4-0601

1.0 INTRODUCTION

Massachusetts Department of Environmental Protection (MassDEP) requested that Nobis Engineering, Inc. (Nobis) review a Phase III Remedial Action Plan (RAP) prepared by Brown and Caldwell and dated August 2016 for the Former Aerovox Facility (the Site), and provide technical comments.

General comments applicable to the entire document are presented first, followed by specific comments grouped by report section (text, tables, figures, and appendices) below.

2.0 GENERAL COMMENTS

1. The mass flux calculations and model results were used to support report text throughout the report. Comments regarding those calculations have been compiled into the discussions of Appendix B and Appendix C.

2. Please review text and appendices to make sure it is clear whether depths are referred to in terms of feet below ground surface (bgs) or feet above mean sea level (amsl).

3. The document should include contingencies for mobilization of contamination during near-shore work, given the appearance of product during excavation as noted in the 9/7/16 meeting minutes (Brown and Caldwell, 2016c). Note that this may impact alternatives for OU1 and OU3.

4. Have the results of the investigation and excavation conducted as part of the IRA changed the estimated extent of contamination to be addressed in OU-3? If so, please adjust the text, tables, figures, and cost estimates accordingly.

5. The uppermost bedrock has not been evaluated in detail because it is generally drilled using a roller bit to install a rock socket. Dense non-aqueous phase liquid (DNAPL) has been detected in both MW-15D and MW-15B, and since no evidence has been provided

that shows the interval between the two is free of contamination, the top of the shallow bedrock plume should be the top of bedrock for both the northern and southern sections. This would impact the mass flux and derived calculations.

6. The deep bedrock treatment area is identified as two hot spots, both located in the northern half of the property. Two shallow bedrock wells are located between these borings to the north (MW-6B and MW-28B) and one to the south (MW-27B). Two of these wells have average concentrations above 5,000 micrograms per liter (µg/L), and no wells are located between these wells to determine the extent of the hot spots to the east and west. Additional characterization work should be performed as part of the remedial design to determine the lateral extent of the identified hot spots in bedrock. This work should be included in the discussion of the OU4 pilot test in Section 8.2.2 (page 8-4).

7. A containment option (such as groundwater extraction) should be retained as a bedrock alternative for comparison, even if it is ruled out as technically infeasible in Section 7. The "hydraulic containment and ex-situ treatment" alternative for groundwater shown on page 2 of Table 4.1 should be retained for OU4 deep bedrock. A groundwater extraction system targeting the known high-concentration deep bedrock fractures may not have the same problems with required high extraction rates compared to shallow bedrock, and may be comparable in feasibility to other treatment methods.

8. The ex-situ treatment scoring for OU3-A is recommended to be slightly higher than described in Section 5.3.1 and Table 5.3, with scores of "good" for timeliness and for non-pecuniary concerns. Treatment of ex-situ soils is not expected to require a significant amount of time (less than the several years required for groundwater remedies), and the ex-situ treatment would indeed raise community concerns, but likely to similar levels as increased truck traffic carrying contaminated soils. These higher values would provide a total score of 23 and are not sufficient to change the overall ranking.

9. The following cost discrepancies were identified between Appendix D and Section 5.3.1.4 (the text matches Table 5.3):

   a. OU3A-1: Appendix D capital = $19.4 million (M), elsewhere capital = $22.7 M

b. OU3A-1: Appendix D estimated total net worth = $20.6 M, elsewhere total net worth = $23.1 M
c. OU3A-2: Appendix D capital = $17.6 M, elsewhere capital = $26.3 M
d. OU3A-2: Appendix D estimated total net worth = $18.8 M, elsewhere total net worth = $26.7 M
e. OU3A-3: Appendix D capital = $2.0 M, elsewhere capital = $2.5 M
f. OU3A-3: Appendix D estimated total net worth = $3.2 M, elsewhere total net worth = $2.9 M

10. The following cost discrepancies were identified between Appendix D and Section 5.3.2.4 (the text matches Table 5.3):

    a. OU3B-2: Appendix D estimated total net worth = $20.0 M, elsewhere total net worth = $13.9 M
    b. OU3B-3: Appendix D estimated total net worth = $15.4 M, elsewhere total net worth = $11.8 M

3.0 SPECIFIC COMMENTS - TEXT

1. The last bullet on page 2-5 states that observed DNAPL is present only in the vicinity of the MW-15 cluster. Boring logs installed in May and July 2016 identified apparent non-aqueous phase liquid (NAPL) in several borings. The text should be updated with these locations. If these locations require new areas targeted for excavation, the discussion of OU3 alternatives should likewise be updated.

2. The last sentence in Section 2.4.1 (page 2-6) appears to imply that migration to surface water is valid only after all response actions are complete. Migration of groundwater contaminants to surface water will continue until effective response actions are implemented. The Site will continue to act as a continuing source until Phase IV Remedial Actions are effectively operating. Note that recent test pitting on September 1, 2016 released small blebs of oil, which were observed bubbling up off shore within the Achushnet River (Brown and Caldwell, 2016c).

3. The operable units are defined as OU1, OU2, OU3A, OU3B, and OU4 in the text and

Table 4.3; as OU-1, OU-2, OU-3A, OU-3B, and OU-4 in the figures and the Section 5 tables; and OU 1 through OU4 in Appendix D. Please maintain consistency for the operable unit definitions.

4. Please define OU3A and OU3B in Section 3.4 (first mention) or (preferably) add a reference to these divisions in Section 2.

5. Alternative OU3A-2 (Section 4.3.3.1) is described as including ex-situ treatment of excavated soil (last bullet on page 4-11). Therefore, the last sentence of the fourth paragraph of page 4-12 should state "This alternative ***requires*** operation of treatment technology."

6. The last paragraph of page 4-13 should refer to Figure 4.3.3***B***-1.

7. Alternatives OU3B-1, OU3B-2, OU3B-3, and OU3B-4 include a vertical barrier wall installed to the top of bedrock. Are there any provisions for keying the vertical barrier into bedrock to prevent migration of contaminated groundwater and/or DNAPL beneath the barrier?

4.0 SPECIFIC COMMENTS - TABLES

1. On Table 4.1 groundwater, zero-valent iron (chemical treatment) was proposed for alternative OU3B-4; so on page 3, second row, (In-Situ Chemical Treatment), the final column should state "Retained for OU-3B and OU-4"

2. On Table 4.1 NAPL, page 4, first row, the last statement in the "disadvantages" column appears to have a typo. Excavation is likely to be difficult to implement in shallow bedrock and not implementable in deep bedrock.

3. Table 4.3.1, page 1, first row (Size and Configuration) states that excavation would not go below the peat layer. If the top of the peat layer is found to be significantly contaminated, this material should also be removed, similar to the excavation conducted for the IRA.

4. The figure references in Table 4.3.1 through 4.3.4 (row 1 and notes) appear to be incorrect. They should refer to Figure 4.3.1-1 through 4.3.4.2.

5. Table 4.3.3, Alternative A3, page 2, row 4 (Substantive Permit Requirements): water treatment from storm sewer jetting would require treatment and discharge, similar to the other alternatives.

6. Table 4.3.3, page 2, row 4: Soil with PCB concentrations greater than 50 mg/kg (Alternative OU3-A1) that would be removed and disposed of off-site would also need to comply with EPA disposal requirements, similar to OU3-A2.

7. Table 5-3, page 6: Alternative OU3-B2 and OU3-B3 will not restore the existing area entirely to its prior condition because a treatment system will be located on-site. The text should be modified to reflect this. However, the impact is not likely to be significant enough to change these alternatives' "fair" ratings for non-pecuniary impacts.

8. Table 5-4, page 1: Given the difficulty of targeting treatments in the deep bedrock, the certainty of success for both alternatives should be lower. The certainty of success should be changed to "moderate" for OU4-1 and "high" for OU4-2. This does not change the scoring of the alternatives relative to each other.

9. Table 5-4, page 3: in-situ thermal treatment (used in alternative OU4-2) poses thermal risks both during active system operation and post-operation monitoring. Given these risks and the additional material handling for vapor recovery, the risk rating for alternative OU4-2 should be changed to "fair" (2), reducing the overall score to 22. This does not change the selection of alternative OU4-1 as described in the text.

5.0 SPECIFIC COMMENTS - FIGURES

1. The thermal treatment area outline depicted on Figure 4.3.4-2 should be changed to a different color to contrast with the ISCO treatment area outline.

2. On Figures 4.3.4.1 and 4.3.4.2, separate TCE isoconcentration contours should be shown for shallow bedrock and deep bedrock, as these may be treated separately.

Likewise, the shallow bedrock vs. deep bedrock monitoring wells should be identified on the figures.

6.0 SPECIFIC COMMENTS – APPENDIX B (MASS FLUX CALCULATIONS)

1. The calculations in Appendix B convert the TCE concentrations to a mass flux in the bedrock, and then use that bedrock mass flux to convert back to a concentration available to migrate through the riverbed. Because of the factures in the bedrock and the assumptions of non-contamination in areas without fractures, this dilutes the concentrations detected in the bedrock to a much lower value applicable to the river bottom. Due to fracture flow, the concentrations at the river bottom will likely be varied, and that although the average concentration calculated is below the GW-3 standard, it may well be greater in certain areas. This should be noted in the text.

2. Please add a cross-section location map depicting Cross-Section C-C' at an appropriate scale. This map should also show the TCE plume outlines for shallow and medium bedrock and for deep bedrock.

3. Cross-Section C-C':

   a. Check spelling (boundary).
   b. Confirm that the features shown on the cross-section are to scale. Add a horizontal scale, preferably as tick marks on the cross-section itself (similar to the vertical scale).
   c. Adjust calculated concentrations to a reasonable number of significant figures for legibility and to provide a degree of reasonable certainty in the numbers.

4. The division between the shallow-intermediate and deep bedrock zones is described as 160 feet for the northern zone and 125 feet in the shallow zone. Please confirm that these depths are in feet bgs and not feet amsl.

5. The available deep bedrock water level data is extremely limited. Future studies should include installation of additional deep bedrock monitoring wells to better define the potential contaminant mass prior to final remedial system design. Additional data would

improve the mass flux calculations and modeling (and therefore the remedial design) as described below.

   a. The deep bedrock water level data is extremely limited. However, it would be better to develop piezometric contours and gradients specific to the deep bedrock in order to provide more accurate mass flux calculations.
   b. The northern edge of the deep bedrock plume is assumed to be the northern Site boundary. However, the northernmost deep bedrock well (MW-34B) has extremely high average concentrations (up to almost 500,000 µg/L) in the deep bedrock. There are no wells screened below 40 feet amsl to the north, so the northern extent of the plume is unknown. An extension of the bedrock plume to the north would impact the mass flux into the river and may impact final treatment system design.

6. The bulk hydraulic conductivity of the deep bedrock is likely lower than the bulk hydraulic conductivity of the shallow bedrock, because it has fewer water-bearing fractures. Therefore, using the shallow bedrock hydraulic conductivity value for deep bedrock is conservative as stated in the report. However, Brown and Caldwell has already limited the bedrock contaminant mass to few zones within the deep bedrock. Therefore, the ultimate mass flux calculated is not excessively conservative as stated in the report.

7. The northern section of the deep bedrock plume is assumed to be the thickness (height) of the 10-foot well screen in MW-34B below 160 feet (assuming this is in feet MSL) and the southern section of the deep bedrock plume is assumed to be the thickness of the 20-foot well screen in MW-32B below 125 feet. Most of the deep bedrock contamination would be expected to be within the fractures and nearby rock matrix, and therefore, the zones with groundwater flow are most likely to contain the bulk of the contamination, as described by Brown and Caldwell. However, given the limited number of deep bedrock wells installed and the irregular nature of the fractures, a larger contaminated deep bedrock thickness should be used to estimate the mass flux in deep bedrock, such as double the height of the screened zones (20 feet in the northern section and 40 feet in the southern section).

8. The third bullet on page 3-8 suggests that high contaminant concentrations in the vicinity

of MW-34B may be attenuating as the groundwater migrates upward from deep to shallow bedrock. Given that the concentrations are sufficiently high to be potentially indicative of NAPL, it is likely that the higher concentrations at depth are from a NAPL that has migrated downward and is acting as a continuous source at depth, causing locally high concentrations relative to more shallow bedrock, especially since the vertical gradients are not consistently upward in MW-34B. Therefore, the shallow bedrock concentrations may not be attenuating at all.

7.0 SPECIFIC COMMENTS – APPENDIX C

1. The peat/outwash unit is modeled as a single unit to the ground surface. Would using a fourth model layer (fill above the peat) help calibrate the model with the existing water level data? In addition to being a more accurate representation of the subsurface, an upper fill unit in direct contact with available surface recharge and minimal contact with the tidally-influenced groundwater (assuming that the sheetpile wall is keyed into the peat) may have a lower tidal response and reduce the need for an extremely low hydraulic conductivity for the peat.

2. The boundary conditions include a single recharge boundary applied over the uppermost model layer, with a recharge value of 10 inches per year. However, a significant portion of the domain area is paved or under building cover, including the former Aerovox facility. The recharge should be adjusted to account for expected urbanization effects.

3. The locations of cross-sections (i.e. Row #101) should be shown in plan view. Does Row #101 include the sheetpile wall? The sheetpile wall does appear in plan view in Figure 1-4, but not the cross-sections.

4. The surface topography for the units used in the model (top of bedrock, top of glacial outwash/fill) should be shown in plan view.

5. As discussed in Section 2.4.2, last paragraph on page 2-7 and page 2-8, The NAPL in the vicinity of UV-17 and MIP-23 will be removed via excavation to just below the peat layer. Is the excavation expected to impact the modeled groundwater flow regime?

8.0 REFERENCES

AECOM, 2015. Phase II Comprehensive Site Assessment. Former Aerovox Facility, 740 Belleville Avenue, New Bedford, Massachusetts, RTN 4-0601. September 18, 2015.

Brown and Caldwell, 2016a. Immediate Response Action Status Report # 7, Former Aerovox Facility. August 2016.

Brown and Caldwell, 2016b. Phase III Remedial Action Plan – RTN 4-601, Former Aerovox Facility, New Bedford, MA. August 2016.

Brown and Caldwell, 2016c. Meeting Minutes: Weekly IRA Progress Meeting #5, September 7, 2016. Former Aerovox Facility, New Bedford, MA. September 2016.